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MOTOROLA, INC. 1303 EAST ALGONQUIN ROAD IL01/3RD SCHAUMBURG, IL 60196				
EXAMINER				
MEW, KEVIN D				
ART UNIT		PAPER NUMBER		
2616				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

Docketing.Schaumburg@motorola.com
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Office Action Summary

Application No.

10/533,557

Applicant(s)

MAZET ET AL.

Examiner

Kevin Mew

Art Unit

2616

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2008.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5 and 7-10 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☒ Claim(s) 9 is/are allowed.
6) ☒ Claim(s) 1-3, 5, 8 and 10 is/are rejected.
7) ☒ Claim(s) 7 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

Detailed Action

Response to Amendment

1. Applicant's Remarks/Arguments filed on 4/23/2008 have been considered. Claims 4, 6, 11-12 have been cancelled by applicant. Claims 1-3, 5, 7-10 are currently pending.
2. Acknowledgement is made of the amended claims 2-3, 8, 10 and the cancelled claims 4, 6 regarding the claim objections set forth in the previous Office action. The corrections are acceptable and the claim objections are now withdrawn.
3. Acknowledgement is made of the amended claim 9 regarding the 35 U.S.C. 112, second paragraph rejection set forth in the previous Office action. In view of the amended claim 9, the previous 35 U.S.C. 112, second paragraph rejection is now withdrawn.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 5, 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 5, the equation described in line 3 is missing. Therefore, there is insufficient antecedent basis for all the equation symbols described in lines 3-6 of the claim.

In claim 8, lines 4-5, there is a lack of description/definition of what all the equation symbols represent. As such, claim 8 is indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems (XP-001133082) in view of Turbo Channel Estimation for OFDM systems on highly time and frequency selective channels (XP-002171257), and in further view of Matheus et al. (US Publication 2002/0021715 A1).

Regarding claims 1 and 10, XP-001133082 discloses a system for channel estimation in an orthogonal frequency division multiplexed (OFDM) receiver, the system comprising:

demodulation means for applying Fourier transform to a received signal to obtain a frequency domain signal including a plurality of sub-carriers (abstract, and page 488, 2 OFDM Systems with Channel Model, figure 1, and 1st paragraph .. wherein the cyclic prefix is removed at the receiver and the signal is demodulated with a discrete Fourier

Transform...and the independent data symbols are modulated by N sub-carriers and inverse discrete DFT....as disclosed in AAPA);

decoding means for decoding the received signal (page 487, 1st paragraph *introduction*, wherein OFDM, channel state information between transmit and receive antenna pairs is required for decoding, and a channel estimator further explained in column 1 and 2 (AAPA) of page 487; page 488 further comprising channel estimation algorithm, column 1, lines 1-12, wherein for clarification purpose, channel estimator algorithm comprising estimating probabilities of coded bits for plurality of frequency domain sub-carriers).

XP-001133082 may not explicitly show an estimating probabilities of coded bits for at least said plurality of frequency domain sub-carriers; and channel estimation means for performing channel coefficient estimation for each of said plurality of frequency domain sub-carriers using channel coefficient estimates for at least one other of said plurality of frequency domain sub-carriers.

However, XP-002171257 discloses an optimum turbo channel estimation algorithm for OFDM systems on highly selective fading channels... (Abstract), and as well further being illustrated in details; on page 2977, column 2, multiplicative two-dimensional fading channel characteristic, figure 1 comprising proposed receiver comprising DFT technique, and page 2978 comprising, sections 6 further disclose maximum a posteriori discrete channel estimation, EM algorithm, and page 2679, section 7 discloses conditional probabilities computation, and simulation result.

Therefore, it would have been obvious to combine XP-001133082 with the teaching of XP-002171257 with the motivation for a receiver with spatial diversity using an optimum turbo

estimation of the multi-path fading channels, which can increase degradation in performance with respect to the perfect channel estimation at low BER, and it can further improve time-frequency interleaving of coded data symbols and an enhanced initialization of the estimation algorithm; whereas further teaching of XP-002171257 can be implemented in order to obtain good initial estimates, pilot symbols are used to estimate the initial value of the corresponding channel parameters according to a data-aided scheme, then the initial values of the complete channel parameters are determined using an interpolation technique in order to eliminate errors during transmission.

XP-001133082 and XP-002171257 may not explicitly show repeating said steps of estimating probabilities and performing channel coefficient estimation so as to improve iteratively an accuracy of said channel coefficient estimates and wherein the step of performing channel coefficient estimates comprises replacing previously estimated channel coefficients of said plurality of frequency domain sub-carriers with respective current channel coefficient estimates.

However, Matheus discloses adaptively and repeatedly estimating channel coefficients of a plurality of sub-carriers and replacing old channel coefficient estimates with a new set of N channel coefficient estimates (paragraphs 0086-0088 and Fig. 4-2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined channel estimation method of XP-001133082 and XP-002171257 with the teaching of Matheus in adaptively and repeatedly estimating channel coefficients of a plurality of sub-carriers and replacing old channel coefficient estimates with a new set of N channel coefficient estimates such that the modified estimation method of XP-

001133082 and XP-002171257 will show repeating said steps of estimating probabilities and performing channel coefficient estimation so as to improve iteratively an accuracy of said channel coefficient estimates and wherein the step of performing channel coefficient estimates comprises replacing previously estimated channel coefficients of said plurality of frequency domain sub-carriers with respective current channel coefficient estimates.

The motivation to do so is to provide a frequency deviation selection and evaluation method for adaptively correcting frequency deviation and for arriving at a more accurate frequency deviation without using a large computational overhead.

Regarding claims 2 and 3, XP-001133082 discloses the same limitation as disclosed above in claim 1 and 12. Furthermore, **XP-001133082** teaches a method of channel estimation wherein said step of performing channel coefficient estimation for substantially each of said plurality of frequency domain sub-carriers uses channel coefficient estimation benefits from said channel coefficient estimates for substantially all the other frequency domain sub-carriers of said plurality (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems - page 488, sections 2, column 1-2, page 490, first paragraph... the number of prefix symbols, takes small values with respect to the total number of sub carriers carrying the data..., and page 491, sections 5, simulation results ...).

Allowable Subject Matter

6. Claim 7 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 9 is allowed.

The following is a statement of reasons for the indication of allowable subject matter:

In claim 7, a method of channel estimation according to claim 5, wherein repeating said step of performing channel coefficient estimation comprises applying a cost function on an Expectation-Maximization algorithm on said plurality of frequency domain sub-carriers to improve said channel coefficient estimates.

In claim 9, a method of channel estimation in a wireless orthogonal frequency division multiplexed (OFDM) communication system, comprising the steps of:

“wherein said step of performing a channel coefficient estimation comprises applying a forward-backward algorithm on said received signal to said plurality of channel coefficient estimates in which estimates are made in a first order of said plurality of frequency domain sub-carriers and subsequently estimates are made in a reversed order of said plurality of frequency domain sub-carriers so as substantially to equalise an estimation accuracy across said plurality of frequency domain sub-carriers.”

Response to Arguments

7. Applicant's arguments with respect to claims 1-3, 5, 7-10 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Mew whose telephone number is 571-272-3141. The examiner can normally be reached on 9:00 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi Pham can be reached on 571-272-3179. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kevin Mew /K. M./
Examiner, Art Unit 2616

/Chi H Pham/
Supervisory Patent Examiner, Art Unit
2616
7/18/08